

26. Abnormalities in the Common Frog (*Rana temporaria*).
By J. H. LLOYD, M.Sc., F.Z.S., Zoological Department,
University College, Cardiff.

(Text-figure 1.)

[Received January 13, 1921: Read April 5, 1921.]

Both specimens described in the following notes were discovered on dissecting a number of frogs for class purposes at the beginning of the present session.

SPECIMEN A. *Persistence of the right Posterior Cardinal vein in an adult male Rana temporaria.*

The occasional persistence of the posterior cardinal vein was first noted by Howes (2) in 1888, in an adult female *Rana temporaria*. In this specimen the postcaval vein was normally developed and the persistent left posterior cardinal functioned as an azygos vein. The cardinal was continuous posteriorly with the renal portal vein. According to Parker (6), Howes afterwards came across another frog in which an almost similar arrangement occurred.

In the following year Parker (6) described a male frog with a persistent left posterior cardinal vein, in which the hepatic veins opened direct into the sinus venosus.

In 1905 Woodland (7) described a male *Rana temporaria* in which a large posterior cardinal vein persisted which was continuous posteriorly with the enlarged right renal portal vein. The venous blood was supplied to both kidneys by the left renal portal only.

O'Donoghue (4 & 5) has described eight cases of the persistence of posterior cardinal veins in adult frogs. Seven of his specimens were males (six *Rana temporaria* and one *Limnodymastes peronii*), and the other was a female *Rana temporaria*. The majority of his specimens in addition exhibited abnormalities of the renal portal veins.

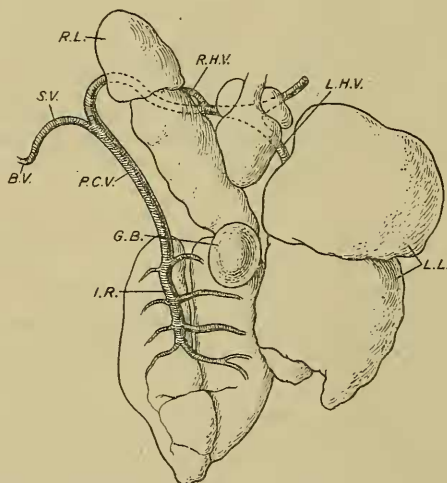
Description of Specimen A.

This specimen exhibits a persistent right posterior cardinal vein which runs from the anterior of the interrenal portion of the postcaval vein, and opens anteriorly into the subclavian vein about halfway along its length. The interrenal vein is normally developed and receives the renal and spermatic veins from the kidneys and spermaries of right and left sides. There is absolutely no trace of the left posterior cardinal vein or of the postcaval vein anterior to the kidneys. The renal portal veins exhibit no abnormalities.

The liver in this specimen is also peculiar. The left lobe is normally developed and the left hepatic vein opens directly into the sinus venosus. The right lobe is an elongated, slightly dorso-ventrally flattened, cylindrical structure which is anteriorly directed and terminates near the posterior edge of the mylohyoid muscle. This lobe is divided into two portions by a transverse constriction. About halfway along its length on the mesial side of the dorsal surface, a hepatic vein runs out and opens into the right precaval vein. The internal and external jugular veins enter the precaval together dorsal to the abnormal lobe of the liver.

As far as I can ascertain this is the only case yet recorded of a hepatic vein opening into a precaval. This irregularity is obviously due to the abnormal condition of the liver.

Text-figure 1.



Sketch of specimen A from ventral surface, shewing persistent right posterior cardinal vein and abnormal liver. B.V. brachial vein; G.B. gall-bladder; I.R. interrenal vein; L.H.V. left hepatic vein; L.L. left lobe of liver; P.C.V. right posterior-cardinal vein; R.H.V. right hepatic vein; R.L. right lobe of liver; S.V. subclavian vein.

According to Hochstetter (1) the posterior portions of both posterior cardinal veins fuse in Amphibia to form the interrenal ("Urmiere abschnitte") portion of the postcaval, the anterior portion ("Leberabschnitt") of the latter being formed by a venous connection between the anterior end of the interrenal vein and the tip of the liver. It is suggested that in the specimen described above the formation of this venous connection was

interfered with by the growth of the liver towards the anterior end of the animal. (Kerr (3) has pointed out "that in *Lepidosiren* and *Protopterus*, the tip of the liver is in contact, and fused, with the tip of the right kidney.") This necessitated the persistence of one of the posterior cardinal veins to carry on the functions of the postcaval in returning blood from the posterior end of the body.

It is interesting to note that this specimen being a male supports O'Donoghue's (4) suggestion that the absence of the postcaval and persistence of a posterior cardinal vein appears to be correlated with the sex of the animal.

SPECIMEN B. *Abnormal Genital Organs in a male*
Rana temporaria.

This specimen possessed a greatly hypertrophied testis, which completely covered the left kidney, when viewed from the ventral surface. There was absolutely no trace of a testis on the right side, but the fat-body on both sides was well developed, that on the right side being attached to the kidney.

The right kidney was about one-eighth of an inch shorter than the left, and was distorted in such a way as to give it a cylindrical appearance, and to cause the ureter to run on the dorsal surface instead of on the outer edge. Both kidneys were so closely apposed that it was difficult to ascertain whether there was any actual fusion. There was a well developed seminal vesicle attached to each ureter, and from the fact that both seminal vesicles were apparently filled with sperms it seems probable that there was some degree of fusion.

The left renal portal vein was normal but the right renal portal was much reduced in size.

LITERATURE.

1. HOCHSTETTER, F.—Beiträge zur vergleichenden Anatomie und Entwicklungsgeschichte des Venensystems der Amphibien und Fische. *Morphol. Jahrb.* Bd. 13, 1888.
2. HOWES, G. B.—Note on the Azygos Vein in the Anurous Amphibia. *Proc. Zool. Soc.* 1888, p. 122.
3. KERR, J. GRAHAM.—Note on the Posterior Vena Cava in *Polypterus*. *Proc. Roy. Physiol. Soc. Edinburgh*, vol. xviii. 1910.
4. O'DONOGHUE, C. H.—The Persistence of Posterior Cardinal Veins in the Frog, together with some Remarks on the Significance of the Renal Portal System. *Anat. Anz.* Bd. 36, 1910.
5. O'DONOGHUE, C. H.—Further Instance of the Persistence of Posterior Cardinal Veins in the Frog. *Anat. Anz.* Bd. 43, 1913.

6. PARKER, W. N.—On the Occasional Persistence of the left Posterior Cardinal Vein in the Frog, with Remarks on the Homologies of the Veins in the Dipnoi. Proc. Zool. Soc. 1889, p. 145.
7. WOODLAND, W.—On a New Mode of Persistence of the Posterior Cardinal Vein in the Frog: with a Suggestion as to the Phylogenetic Origin of the Post-caval Vein. Zool. Anz. vol. xxviii. 1905.